The Emission Offset Policy:

Its Impact Upon the Central Naugatuck Valley Region

Central Naugatuck Valley
Regional Planning Agency
20 East Main Street
Waterbury, CT 06702

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the Central Naugatuck Valley Region

AUTHOR: Central Naugatuck Valley Regional Planning Agency

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Regional Planning Agency
20 East Main Street
Waterbury, CT 06702
Phone: (203) 757-0535

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ABSTRACT:

This report evaluates the value of the offset policy as an economic development tool in the Central Naugatuck Valley Region. It also identifies the relationship between air quality and employment trends in a Region that has historically been an important manufacturing center in Western Connecticut. Finally, the report has developed emission factors for different industry types that may be used in evaluating new firms seeking to locate in the City of Waterbury or the Central Naugatuck Valley Region.

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The Waterbury Labor Market Area (WLMA) has historically been known for its manufacturing activities related to the production of brass and copper goods. The Waterbury Labor Market Area's strength has also been a weakness as well. Historically, the Region's dependence upon manufacturing activities in large part accounted for the somewhat dirtier air found in Waterbury compared to most other cities in the United States. This problem was quite evident during the period 1950 to 1970 when Waterbury was a prosperous manufacturing center with numerous large industries emitting enormous quantities of uncontrolled pollutants.

However, since the promulgation of state and federal air quality regulations and the rapid decline in manufacturing employment in the brass, copper and rubber industries in the WLMA, air pollution levels have, by and large, subsided to acceptable levels. Nonetheless, despite the promulgation of federal and state regulations, the decline in the number of "dirty" industries in the Region and the greater level of pollution control equipment utilized by industry, the Region continues to face a serious problem of air quality violations for excessive levels of total suspended particulates and ozone in the ambient air. In 1977 and 1978, the City of Waterbury had levels of total suspended particulates (TSP) which were in excess of the national primary standard designed to protect the public health. By 1979, the level of TSP subsided somewhat but still remained in excess of the national secondary standard designed to protect property values and vegetation. Similarly, the Region has faced a serious problem with excessive levels of ozone caused in large part by emissions of hydrocarbons from automobiles.

These air quality violations are of concern for two reasons: First, they have an adverse affect upon the public health especially for elderly persons, children and those suffering from respiratory problems; secondly, these violations of air quality standards purportedly have a direct impact upon the prospects for economic development within the Region. Under the Clean Air Act amendments of 1977 (and subsequent regulations issued by the U.S. Environmental Protection Agency and modified by the Federal Courts) no new industry classified as a major stationary source which emits 100 tons or more of total suspended particulates or sulphur dioxide (after the use of control equipment) can be constructed in an area which has not attained national air quality standards unless it can show a net improvement in air quality. Similarly, no existing industry classified as a major stationary source which emits 100 tons or more (after the use of control equipment) can expand the size of its operations if such expansion would entail a degradation of air quality in a non-attainment area. In effect, the EPA regulations appear to place a virtual halt to the growth of selected large industry groups in non-attainment areas like the Central Naugatuck Valley to ensure that these areas can meet the goals of the 1977 Clean Air Act.

1. Offset Policy

A closer look at the Clean Air Act reveals that economic development may largely be unaffected by the regulatory constraints and construction freeze placed upon large industry groups. According to the Clean Air Act only those industries which are classified as major stationary sources (i.e., 28 industry groups which emit 100 tons or more of any one pollutant after controls or any industry which emits 250 tons or more after controls) are subject to special scrutiny by EPA. In order to minimize the severity of the Clean Air Act, the U.S. Environmental Protection Agency has developed a special policy called the Offset Policy which is designed to allow economic development while simultaneously protecting air quality. The Offset Policy only applies to major stationary sources expanding or locating in a non-attainment area when such expansion or location would generate 100 tons or more of emissions for pollutants classified as non-attainment. Major stationary sources choosing to locate in a non-attainment area will only be allowed to begin construction if they can demonstrate a means of offsetting the increased emissions from the new plant so that a net air quality improvement is achieved within the Region.

A net improvement in air quality can be accomplished by placing greater controls upon an existing industry so that the emissions from the new firm are offset by the reductions created by greater controls on an existing firm. For example, imagine that a primary metals firm plans to move to Waterbury and expects to have annual emissions of 250 tons of total suspended particulates. The new firm would either have to offset these emissions from (1) emission reductions generated from existing firms in the area, or (2) from area sources of TSP. If such offsets are not available the firm would have no other choice but locate in another area, where there is no air quality problem. For existing firms the offset policy also includes the option of creating an internal offset known as the "Bubble" wherein the increased emissions from plant expansion can be offset by greater controls placed upon other point sources within the firm which are easier and less expensive to control.

While the offset policy appears to create some very serious impediments for economic development, these impediments are less of an issue than most economic development officials believe. The CNVRPA believes that the offset policy will probably have very little application in practice largely because there are only 28 industry groups which fall within the definition of major stationary source and these industry groups are not concentrated in New England or Connecticut. Table 1 lists the 28 major industry groups regulated by the 1977 Clean Air Act Amendments and the equivalent classification of these industries under the Standard Industrial Classification Code. Table 2 identifies the location of establishments that would be classified as major stationary sources if they emitted 100 tons or more by geographic regions of the United States. Significantly, while 27.8 percent of the total manufacturing employment in the United States is in New England, only 6.7 percent of all the establishments that might be classified as major stationary sources are located in New England. In effect, there are no significant advantages in locating within New England for the 28 major stationary sources regulated by the Clean Air Act (see Table 3). This largely reflects the fact that the 28 major stationary sources are industries which tend to locate as close as possible to their source of raw materials in order to reduce the cost of transportation. Producers of cement, pulp, iron ore, aluminum ore, sulphuric acid, lead, lime, coal, coke and chemicals have tended to locate in the South, Northcentral or Western regions of the United States where there is a wealth of natural resources. In 1972, a total of 6,192 establishments or 76.3 percent of all establishments that might be classified as major stationary sources (if they emitted 100 tons or more) were located in the South, Northcentral or Western regions of the United States. In contrast, there are only 51 establishments in Connecticut emitting 100 tons or more which would be considered major stationary sources. Significantly, 72 percent or 37 of the 51 establishments are major stationary sources by virtue of the fact that they emit 250 tons or more of one of the five regulated pollutants. Table 4 indicates that there are only two major stationary sources located in the Central Naugatuck Valley (Century Brass and Hemingway & Bartlett) and only 22 in Air Quality Control Region 42 (AQCR 42).

According to the Clean Air Act if there is a violation of the primary standard for any one pollutant within a subdistrict of an AQCR then the total AQCR is deemed to be non-attainment. The fact that Waterbury has been in violation of the primary standard for total suspended particulates, technically makes the entire Air Quality Control Region 42 non-attainment.* This could have a negative impact upon the growth prospects of three major stationary sources of total suspended particulates in AQCR 42. The three major stationary sources of TSP that could be affected by the enforcement of an Offset Policy are the East Hartford Incinerator, Hartford Electric Light Company in Middletown and Connecticut Light and Power Company in Milford. Before any of these three establishments can make a major modification in their plant the U.S. Environmental Protection Agency initially requires that the source be able to demonstrate that (1) increased emissions will be offset, and (2) the impact of the increased emissions be offset as well. However, EPA has recently relaxed its policy regarding offsets for impacts since it would clearly minimize the economic development value of the offset policy as a whole. Consequently, emission offsets remain the only regulatory tool still favored by EPA. Emission offsets can be created in a variety of ways: (1) by purchasing better control equipment for one's own plant, (2) by curtailing hours of operation, (3) purchasing control equipment for installation on another large point or area source of TSP within the same AQCR, or (4) any other procedure that will guarantee a net air quality improvement from the proposed plant modification or expansion.

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*Waterbury was attainment for TSP in 1979. However, the Clean Air Act requires 3 continuous years without violations to achieve attainment status. Consequently, the earliest that AQCR 42 could reach attainment is in 1982. The Department of Environmental Protection unofficially considers the Central Naugatuck Valley Region to be the non-attainment region. If this unofficial policy is adopted then the remainder of AQCR 42 would not be subject to the economic sanctions created by the non-attainment status of Waterbury. The CNVRPA believes that the offset policy should only apply to the area of impact rather than to the entire AQCR 42. In practice this would mean that only Waterbury or one of its air quality grid cells would be designated non-attainment.

The question before us is whether or not these three Connecticut firms are likely to be able to create an offset from their own inventory of emissions or other point or area sources within AQCR 42. Since point sources are easier to control than area sources it may be worthwhile in first evaluating the potential for greater controls placed on these three firms. Based on data supplied by the Department of Environmental Protection these three firms emit a total of 1,009 tons of controlled emissions of TSP per year. Prior to controls, these three establishments emitted a total of 1699.4 tons of TSP per year. Overall, current TSP emissions levels are 41% less than the emission levels prior to the installation of control equipment. This may indicate some possibility for the installation of greater controls but the costs of these controls may be expensive and there may be little interest in installing greater controls if this would mean the sale of their emission rights to another firm. For example, Eric Storch of Uniroyal Chemical has indicated that it costs approximately $4,000 in operating and capital expenditures to control a ton of air pollution. A 50 ton reduction in TSP emission would entail an expenditure of at least $200,000. There is another reason why an offset policy may be unworkable: a lack of large point sources of TSP in Air Quality Control Region 42. As can be seen in Figure 1, there are only four firms in AQCR 42 that emit 100 tons or more of TSP and only 11 firms in the state that emit 100 tons or more of TSP. These 11 firms account for 43.4% of all emissions of TSP from point sources in Connecticut (see Table 5). It would seem that emission offsets would be easiest to develop with these 100 ton sources of TSP. However, a closer analysis reveals that these large sources of TSP are already largely controlled.

A recent study of offset trading in the United States found that the average number of tons of TSP needed to create an offset is 279 tons. Clearly, if this average holds true for Connecticut, there will be little chance of developing an emissions offset for TSP since this would entail (1) the purchase of virtually all existing TSP emissions of any one of the four 100 ton sources of TSP in AQCR 42, or (2) the pooling of offsets from a large number of smaller point or area sources of TSP emissions. This latter possibility appears to be highly unlikely since it would be exceedingly expensive to reduce the pollution levels of smaller firms since most Connecticut industry has already reached 85 to 95 percent control over TSP emissions. Given the fact that the average number of tons needed for a TSP offset in the United States has involved emission levels of 279 tons, it appears that an external offset strategy (i.e., trading between firms versus internal reductions within a firm) is not practicable in Connecticut unless area sources of pollution are included as potential vehicles for creating an offset. The reasons are simple: none of the four 100 ton point sources are likely to sell their emission rights since a sale of 279 tons by any one of these firms would essentially be equivalent to the sale of their establishment. In contrast, an internal offset for TSP may make sense if any of the three major stationary sources decide to expand their facilities. None of the three establishments has achieved the highest levels of controls for TSP so it may still be possible to offset future expansion plans (if they are not very big) by internal offsets created by greater air pollution control equipment being placed on existing stacks or other emission sources that can be controlled inexpensively.

Offsets as an economic development tool

Although there may be little that can be done for creating an offset between existing firms there is still reason to consider the need for an offset policy in light of the possibility that lack of an offset policy would preclude major stationary sources from locating within Air Quality Control Region 42.

In order to determine the types of firms that might be affected if the state declines to adopt an offset policy, the CNVRPA identified the types of industries within the United States which typically emit 250 tons or more of TSP. Firms with 250 tons or more of TSP automatically are classified as major stationary sources and consequently would be subject to the offset policy in the same way as the 28 major stationary sources identified by the 1977 Clean Air Act. Table 6 identifies thirty industry groups in the United States which on the average emit 250 tons or more of TSP per year. By and large, just like the 28 major stationary sources regulated by the 1977 Clean Air Act, few if any of the thirty industry groups would have a locational advantage in the State of Connecticut. Indeed, the bulk of these industries are dependent upon proximity to natural resources which are not typically found in Connecticut or nearby areas. The only possible exceptions might be manufacturers of synthetic rubber, miscellaneous chemical products, and die cut paper and board.

Offset Policy: Who should administer it?

The U.S. EPA would like every State to establish an offset policy in areas of non-attainment. However, the Connecticut DEP does not have any interest in operating the offset policy. Rather, they would prefer EPA to take full responsibility for maintenance of the program. DEP officials believe that it would be better to have EPA administer the offset policy because EPA would probably be less strict. In contrast, Yvonne Gonzalez, Legal Counsel to the Air Quality Technical Demonstration Program believes that EPA would probably be stricter in its application of offset policy and would probably create greater delays in the processing of permits. In her view, DEP should not only administer an offset policy but should also adopt an accommodative strategy that would create offsets for future economic growth by imposing stricter controls on existing sources of TSP. Assuming finances permit, it would appear that the offset policy should be administered by the State to allow for greater control over the standards and procedures applied to new sources entering Connecticut.

Sources of Air Pollution

While Federal and State air quality regulations have been particularly tough on industrial sources of air pollution, these sources no longer account for the bulk of the air pollution problem in the Central Naugatuck Valley Region or the State of Connecticut. As can be seen in Table 7, point sources account for 9.1% of all TSP emissions, 10.9% of all Hydrocarbon emissions, 13.6% of all Nitrogen Dioxide emissions, 0.5% of all Carbon Monoxide emissions and 38.8% of all Sulphur Dioxide emissions in the Central Naugatuck Valley Region. Indeed, the combined emissions from all point sources in the Region generate only 300.1 tons of TSP a year according to data supplied by the DEP. This certainly indicates that there is very little opportunity for generating an emission offset from point sources especially if the typical offset involves 279 tons of TSP. Table 8 indicates that 22 establishments accounted for 88.9% of the 300.1 tons of TSP emitted in 1980. In the case of Waterbury, ten point sources accounted for 91.8% of all the TSP emissions in 1980. (See Table 9.) Despite the fact that only a handful of point sources account for the bulk of the point source emissions of TSP, most of the real problem with air born dust is attributable to area sources such as automobiles, fugitive dust, fires, or emissions from residences, commercial and industrial establishments which are too small to be regulated by the Connecticut Department of Environmental Protection.

Significantly, in the case of Total Suspended Particulates most of the emissions in the Central Naugatuck Valley Region have been generated by vehicles and fugitive dust. In 1980, fugitive dust and particulates emitted by vehicles accounted for 84.2% of all the emissions of total suspended particulates in the Central Naugatuck Valley and 84.4% of all the TSP emissions in Waterbury. (See Table 10.) Based on data generated by the Department of Environmental Protection, the primary source of the TSP problem comes from automobiles and construction activity taking place in Waterbury and the Region. In particular, the reconstruction of Interstate 84 through the center of Waterbury can be singled out as one of the major reasons for the high readings of TSP at the monitoring station in downtown Waterbury. Starting in 1977, construction began on I-84 within several hundred yards of the Waterbury monitoring stations. There was massive blasting and removal of a rock mountain and a great deal of dust was generated. According to DEP officials, 80% of all the TSP measured at the downtown Waterbury monitoring site is attributable to road dust. The road dust at this site has undoubtedly been influenced by the level of total suspended particulates generated in the nearby area from the blasting, crushing and removal of thousands of tons of rock.

While industry is only a minor contributor to the particulate problem, emissions from these firms have been a concern of public health officials for a variety of reasons. Industrial particulates are more likely to be carcinogenic than road dust due to their smaller particle size. Smaller sized particulates are more respirable and consequently are less likely to be filtered out by the nostrils. In contrast, road dust is of a more coarse nature and generally never enters the lungs. For these reasons, among others, the U.S. Environmental Protection Agency is currently considering a new National Ambient Air Quality Standard for Total Suspended Particulates which would distinguish between respirable and nonrespirable forms of particulate matter. If such a standard is adopted, the Waterbury monitoring site may very well find itself in compliance for any standard adopted for respirable particulate matter.*

Degree of Pollution Control

Historically more emphasis was placed upon the control of industrial air pollution because it was simpler to locate and control and resulted in a greater reduction in air pollution than mobile and small point sources of air pollution. In 1980, industry in the Central Naugatuck Valley Region has done about as much as it will ever be able to do to reduce the total air pollution levels in the Region. Overall, emissions from point sources of total suspended particulates have been reduced by 96.7% within the Central Naugatuck Valley Region through the use of air pollution controls. (See Tables 11 and 12.) This massive reduction in TSP emissions is largely attributable to air pollution control equipment placed upon eleven major point sources in the Region. These establishments include four sand and gravel operations, six manufacturing establishments and the Waterbury Sludge Incinerator. All told the imposition of controls upon these eleven sources has been responsible for eliminating 95.9% of all the TSP emitted by point sources in the Region (see Table 13). Further controls upon these establishments would seem inappropriate given the degree of control already achieved. For example, Century Brass has eliminated 85% of all of its TSP emissions through the use of controls. Nonetheless, in 1980 it still emits 60.3 tons a year making it the single largest point source of TSP in the Central Naugatuck Valley Region. Any further reductions in the level of TSP emitted by Century Brass can be expected to be much more expensive to implement and have a greater adverse impact upon that company and the economy of the Region as a whole than similar efforts focused upon TSP emissions generated by fires, fugitive dust and vehicles.

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*DEP officials also indicate that TSP levels are expected to drop as a result of improved monitoring techniques. The use of covers to eliminate passive sampling errors is expected to reduce monitored TSP emissions levels by 13% in Waterbury.

Air Quality and Employment: Growth Trends

Is there any relationship between air pollution and employment growth? What are the employment trends of those responsible for the bulk of air pollution in the Central Naugatuck Valley Region? In order to identify the relationship between employment growth and air pollution, the CNVRPA staff surveyed the employment trends of all establishments with 90 or more employees within the Central Naugatuck Valley Region. A total of 94 establishments were surveyed. Twenty-five establishments or 26.5 of the total had a net decline in employment over the period 1977 to 1979. Significantly, these 25 establishments accounted for 30.5% of the total employment, but contributed 36.4% of the total TSP and 40.6% of the total SO_2 emitted by firms with 90 or more employees (see Table 14). In effect, declining industry groups have been generating a disproportionate share of the Region's air pollution.

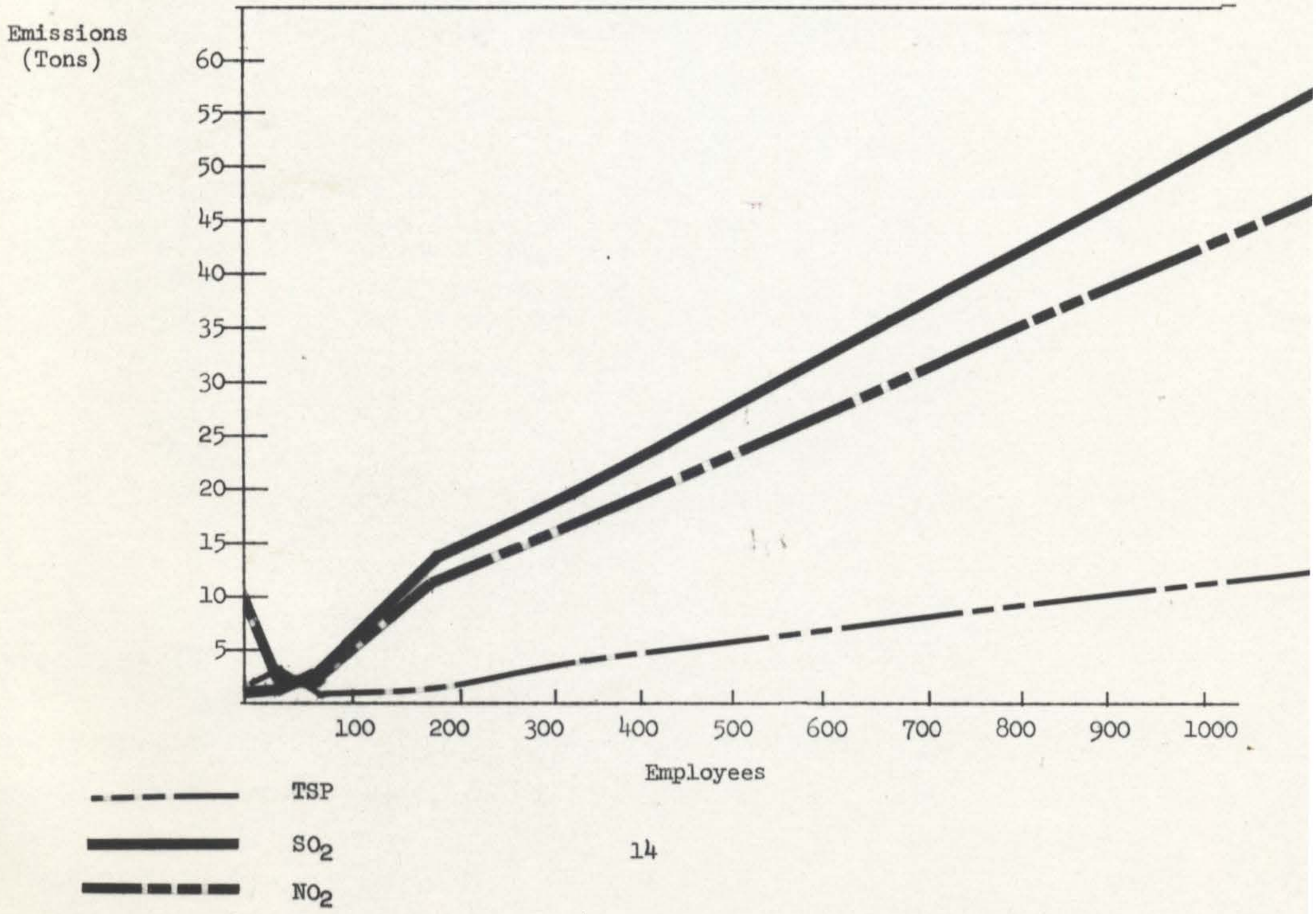
Air Quality and Employment: Growth Projections

The Connecticut Department of Environmental Protection has projected future levels of air pollution for industry groups in Connecticut on the basis of employment projections developed by the Connecticut Department of Labor. DEP has assumed that "growth in employment in any industry will bring about a corresponding increase (or decrease) in emissions." This one for one relationship between employment and air quality is advocated by DEP with some trepidation. In particular, they indicate that this one for one relationship may not be reasonable for non-manufacturing activities. Nonetheless, DEP has adopted this formula for projecting the total emissions for all pollutant types for the years 1982 and 1987. The years 1982 and 1987 are significant dates from the viewpoint of the Clean Air Act. By 1982 all states are required to achieve clean air unless they obtain a variance from the U.S. EPA because of their inability to meet the deadlines. If a variance is obtained then 1987 becomes the year when clean air must be achieved. Air Quality projections for 1982 and 1987 can have a significant impact upon the economic development plans of the state and the Central Naugatuck Valley Region. If DEP projects that emission levels will increase as a result of employment growth, the Region and the state may be encouraged to adopt strict and expensive air pollution control strategies to reduce these emissions.

In order to test the validity of DEP's assumptions, the CNVRPA staff surveyed 254 selected industry groups in Connecticut to determine the relationship between emissions and employment levels and between emissions and the square feet of the plant. Thirty-seven different industry groups at the three digit level of Standard Industrial Classification were surveyed. Overall the survey revealed that in 1980 the average emission from industry in Connecticut did not increase in direct proportion to the number of employees within a firm (see Table 16). Figure 2 clearly illustrates the fact that there is not a direct linear relationship between employment levels and emissions of TSP, SO_2, and NO_2.

Figure 2

Relationship between Air Pollution Emissions and Employment for 254 Selected Industry Groups in Connecticut: 1980



Other factors, besides employment, clearly influence emissions of the five regulated pollutants. In particular, emission levels are influenced by the types of products produced by a given industry (see Table 16). The CNVRPA survey revealed substantial differences in the average emission rates of TSP between the 37 different industry groups. At one extreme manufacturers of miscellaneous non-metal mineral products (SIC Code 329) emit .338 tons of TSP per employee per year. At the other extreme manufacturers of watches, clocks and watchcases (SIC Code 387) emit .0003 tons of TSP per employee per year.

In addition, the size of the plant influences the emission levels of industry. Larger firms, in terms of square feet of floor area, have more emissions than smaller firms. In 1980 the average Connecticut firm with over 250,000 square feet or more of floor area emitted 15.9 tons of TSP, 66.89 tons of SO_2, 53.7 tons of NO_2, 30.08 tons Hydrocarbons and 4.07 tons of Carbon Monoxide per year. In contrast, Connecticut firms with less than 25,000 square feet of floor area emitted on the average .57 tons of TSP, 1.79 tons of SO_2, 1.48 tons of NO_2, .01 tons of Hydrocarbons and .25 tons of Carbon Monoxide per year (see Table 17).

Air Quality and Employment: Policy

What industries can be expected to stimulate employment growth and maintain low levels of air pollution? Similarly, what industry groups should be avoided because they can be expected to decline in employment and generate large volumes of air pollutants? To the extent that air pollution levels can be influenced by marketing strategies of local and regional economic development officials, it becomes important to know the answers to these questions. In 1979, the CNVRPA prepared a report titled The Locational Advantage of the Waterbury Labor Market Area: 21 Industries with Growth Potential. The report idientifies industry groups at the 4 digit level of Standard Industrial Classification which are ideally suited for the Waterbury Labor Market Area and would be compatible with the energy and environmental constraints associated with the Region. The 21 industry groups are considered to have a locational advantage in the WLMA and to be low emitters of air pollution based on their low utilization of energy. However, in order to verify the validity of this assumption, the CNVRPA staff surveyed the emission characteristics of 78 Connecticut industries falling into these 21 industry groupings. The survey revealed that with the exception of producers of converted paper products (SIC 2649) all of the 21 industry groups had relatively low emissions of TSP (see Table 18). In effect, the survey of Connecticut industry confirmed that the 21 industry groups offer both employment growth potential and low emissions of total suspended particulates.

Air Quality and Employment: Emission Projections for Waterbury Industrial Parks

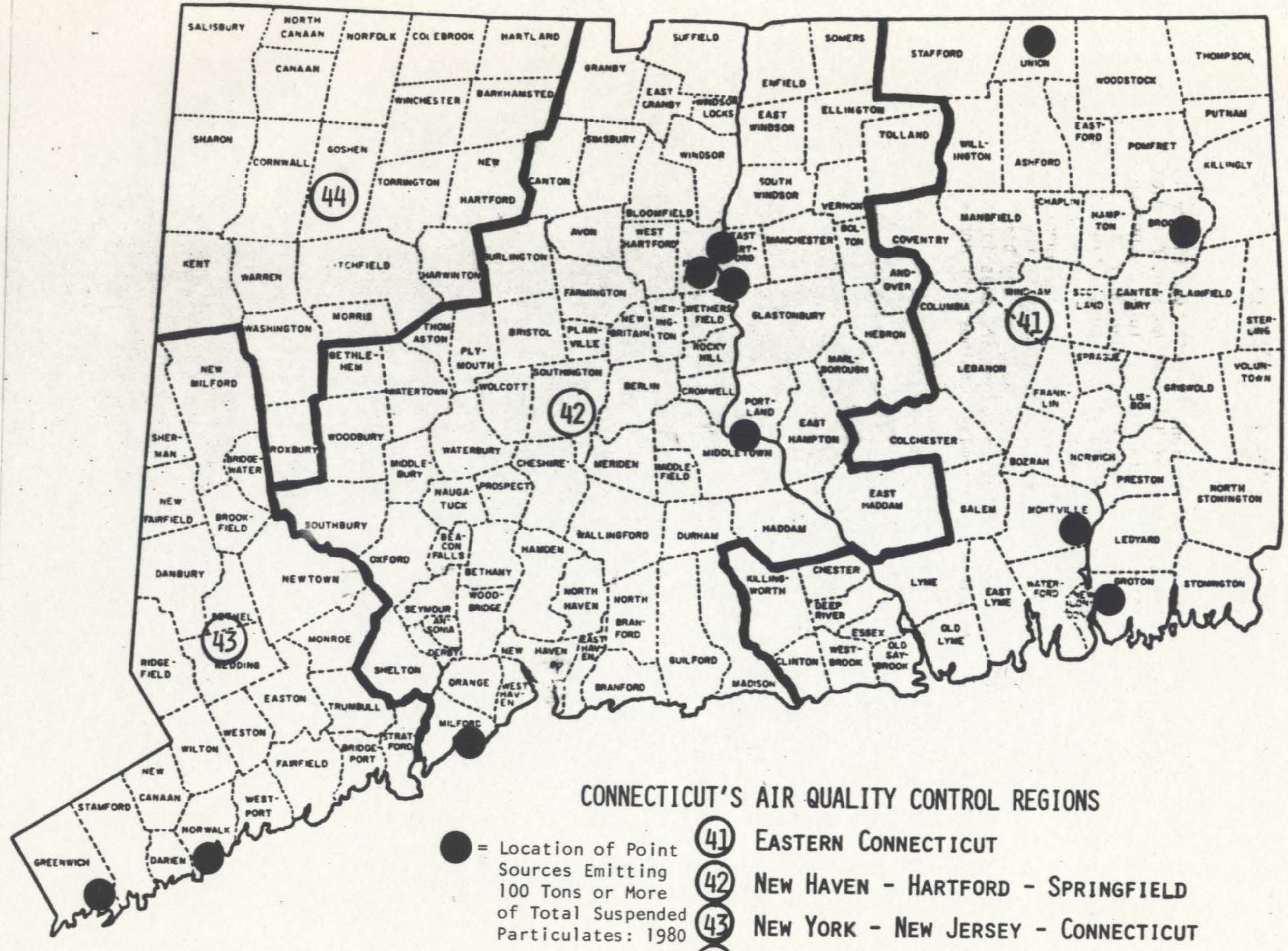
What will the emission levels of TSP be in Waterbury once the City's industrial parks are fully developed? In order to estimate the probable air quality impact of future industrial development, the CNVRPA staff evaluated the development potential of the Captain Neville Drive Industrial Park and the Waterbury Industrial Commons. Based on the constraints to development in the Waterbury zoning regulations, industries were identified which were permitted as a right in the Industrial Park (IP) zone (Captain Neville Drive) and the Industrial General (IG) zone (Waterbury Industrial Commons). It was assumed that both industrial zones would be developed to the maximum degree allowed by zoning standards for maximum ground coverage and maximum height of buildings.

This approach undoubtedly overestimates the likely level of future industrial development in Waterbury but serves as a useful reference point for examining the impact of industrial emissions upon ambient air levels of TSP and SO_2. Two different scenarios were developed for the two industrial zones: one depicts what air quality might be like if the worst types of industries locate in Captain Neville Drive and at Waterbury Industrial Commons. The second depicts what air quality might be like if the best types of industries locate in these two industrial zones. The worst industry groups were chosen based on their emission levels per employee. The best industry groups were chosen based on the fact that they were selected as having growth potential in the Waterbury Labor Market Area based on the findings of the CNVRPA study The Locational Advantage of the Waterbury Labor Market Area: 21 Industries with Growth Potential.

The two scenarios result in markedly different levels of TSP and SO_2 emissions. The worst case scenario for Captain Neville Drive predicts that TSP emissions could be as high as 79 tons per year and SO_2 emissions as high as 592 tons per year based on the combined emissions from the expansion of existing firms and the construction of six new firms. In contrast, the best case scenario predicts that TSP emissions would be about 28 tons per year and SO_2 emissions would be about 164 tons per year from the expansion of existing firms and the construction of six new firms having economic growth potential, as well as low emission characteristics (see Tables 19 and 20).

The two scenarios also result in markedly different levels of total employment. In the worst case scenario for Captain Neville Drive employment at the maximum development of the Park would reach 7,258. In contrast, the best case scenario predicts that employment levels at maximum development would be about 8,193. The sharp difference in employment levels between the worst and best case scenarios reflects the fact that clean industries are generally more labor intensive and usually require less floor space per employee than dirty industries. Since we assumed that the size of the plant would be the same for clean and dirty industries, the best case scenario resulted in the creation of more jobs per floor area.

The emission factors per employee and the square feet of floor area factors per employee were derived from a 1980 survey of 254 Connecticut industries conducted by the CNVRPA. The survey revealed the actual emission rates and square feet of floor area per employee for detailed industry groups at the 3 digit level of standard industrial classification. The worst case scenario developed for the two industrial zones does not reflect the emission potential of all the worst industry groups found in the United States. Rather it only reflects the emission characteristics of the worst industry groups that are allowed by Waterbury's Zoning Regulations. The fact that the maximum TSP emissions per year for Captain Neville Drive Industrial Park would be less than 100 tons clearly indicates that most of the problem with air quality in the future will be solved by the enforcement of the zoning regulations. In effect, the types of industries which are most likely to generate excessively high levels of TSP emissions have already been prohibited from locating in the Captain Neville Drive Industrial Park. In contrast, Waterbury Industrial Commons may experience higher future levels of TSP and SO_2 emissions than the Captain Neville Drive Industrial Park since it is located in the Industrial General (IG) zone where few restrictions are placed on the types of industrial development that may occur.



CONNECTICUT'S AIR QUALITY CONTROL REGIONS

● = Location of Point Sources Emitting 100 Tons or More of Total Suspended Particulates: 1980

- (41) EASTERN CONNECTICUT
- (42) NEW HAVEN - HARTFORD - SPRINGFIELD
- (43) NEW YORK - NEW JERSEY - CONNECTICUT
- (44) NORTHWESTERN CONNECTICUT

Figure 1

Table 1: Standard Industrial Classification Coding of Major Stationary Sources Regulated by the 1977 Clean Air Act

Description of Major Stationary Source Regulated by the Clean Air Act	Classification of Major Stationary Source by the 4 Digit SIC Code	
	Code Number	Description
1. Fossil Fuel Fired Steam Electric Plants	4911	Electric Services
2. Coal Cleaning Plants	1211	Bituminous Coal and Lignite mining
3. Kraft Pulp Mills	2611	Pulp Mills
4. Portland Cement Plants	3241	Cement, Hydraulic
5. Primary Zinc Smelters	3333	Primary smelting and refining of zinc
6. Iron and Steel Mill Plants	(3321	Gray Iron Foundries
	(3322	Malleable Iron Foundries
	(3324	Steel Investment Foundries
	(3325	Steel Foundries, NEC
7. Primary aluminium ore reduction plants	3334	primary production of aluminium
8. Primary copper smelters	3331	primary smelting and refining of copper
9. Municipal Incineration (250 tons/day)	4953	Refuse systems
10. Hydrofloric acid plants	2819	Industrial inorganic chemicals, NEC
11. Sulfuric acid plants	2819	Industrial inorganic chemicals, NEC
12. Nitric acid plants	2873	Nitrogenous fertilizers
13. Petroleum refineries	2911	Petroleum refining
14. Lime Plants	3274	Lime
15. Phosphate rock processing plants	2819	Industrial inorganic chemicals, NEC
16. Coke oven batteries	3312	Blast furnaces, steel works and rolling mills
17. Sulfur recovery plants	2819	Industrial inorganic chemicals, NEC
18. Carbon Black Plants	2895	Carbon black
19. Primary lead smelters	3332	Primary smelting and refining of lead
20. Fuel conversion plants	(2911	Liquified petroleum
	(3312	Blast furnaces, steel works and rolling mills
21. Sintering plants	3312	Blast furnaces, steel works and rolling mills
22. Secondary Metal Production Plants	3341	Secondary refining and smelting of nonferrous metals
23. Chemicals Process Plants	2819	Industrial inorganic metals, NEC
	2833	Medicinal chemicals and botanical products
	3861	Photographic equipment and supplies
24. Fossil Fuel Boilers	NA	Can not be categorized
25. Petroleum storage and transfer Units (300,000 barrel storage capacity)	5171	Petroleum bulk stations and terminals - wholesale

Table 1 (continued)

26. Taconite ore processing plants	1011	Iron ores
27. Glass fiber processing plants	3296	Mineral wool
	2241	Narrow fabrics and other small wares mills
28. Charcoal production plants	2819	Industrial inorganic chemicals, NEC
	2861	Gum and wood chemicals

Total: 28 Regulated Stationary Sources   27 Potential industry groupings at the 4 digit SIC code level

Table 2: Location of Establishments Classified as Major Stationary Sources Under the 1977 Clean Air Act by Regions of the United States: 1972

SIC Code Number	New England	Northeast	North Central	South Region	West Region	U.S. Total
2241	111	235	19	111	11	376
2611	NA	7*	13	28	12	60
2819	14	89	84	152	58	383
2873	1	5	26	32	13	76
2861	4	22	41	70	6	139
2895	NA	3*	3*	28	3*	37
2833	5	57	41	18	24	140
2911	3	38	65	137	83	323
3241	3	32	54	73	40	199
3274	0	11	34	36	23	104
3296	2	23	42	26	17	108
3321	56	213	458	218	103	992
3322	8	24	37	10	2*	73
3324	7	21	28	11	14	74
3325	10	60	101	42	57	260
3312	6	112	125	80	47	364
3331	0	6	2	5	18	31
3332	NA	1*	9	3	3	16
3333	0	4	3*	4	4	15
3334	0	2	2	17	10	31
3341	32	137	117	61	66	381
3861	54	243	158	67	155	623
1011	NA	17*	61	17	17	112
1211	NA	553	390	2,130	117	3,190
Total	316	1,915	1,913	3,376	903	8,107
Percent	6.7%**	23.6%	23.6%	41.6%	11.1%	100%

NA = Not Available

*Interpolated data

**Based on available data only

Source: U.S. Department of Commerce, 1972 Census of Manufacturures, Table 3: General Statistics for Establishments by Industry Group and Industry; 1972

Table 3:

Location Quotient and Employment Changes of Industry Groups Regulated by the 1977 Clean Air Act: Northeast Region of the United States

Code	Description of Industry group	Location Quotient for the Northeast United States	(1000's) Employment Change 1967-1976
2241	Narrow fabrics & other small wares, mills	1.92	-6.1
3324	Steel investment foundries	1.32	NA
2833	Medicinal Chemicals & Botanical Products	1.17	5.7
3341	Secondary refining or smelting of nonferrous metals	1.07	0.6
3333	Primary smelting & refining of Zinc	1.12	-2.7
3325	Steel foundries NEC	.95	NA
3322	Malleable Iron Foundries	.71	-7.8
2819	Industrial Inorganic chemicals NEC	.54	-6.6
3296	Mineral Wool	.50	5.2
3321	Gray Iron Foundries	.45	-2.0
3331	Primary smelting and refining of copper	.44	2.7
3241	Cement hydraulic	.33	-4.5
3274	Lime	.31	0.4
3334	Primary production of Aluminum	.28	2.5
3861	Photographic equipment & supplies	.18	12.4
2861	Gums and Wood chemicals	.11	-1.2
2911	Petroleum refining	.09	-5.0
2873	Nitrogenous fertilizers	.07	NA
3312	Blast furnaces, Steelworks and Rolling Mills	.02	-81.2
2895	Carbon black	0	-.4
3332	Primary smelting and refining of lead	0	0.5

Source: CNVRPA Staff work based on data derived from the U.S. Department of Commerce, 1972 Census of Manufactures.

Table 4: CONNECTICUT INDUSTRIES CLASSIFIED AS MAJOR STATIONARY SOURCES FOR ONE OR MORE POLLUTANT TYPES UNDER THE 1977 CLEAN AIR ACT AMENDMENTS

			Controlled Emissions (tons/year)				
SIC Code	Name of Firm	Location	TSP	SO_2	CO	HC	NO_2
4953	New Canaan Incinerator	New Canaan	8.0	13.0	187.0	8.0	16.0
3724	Pratt & Whitney (2)	Middletown	87.2	349.8	97.8	110.5	636.3
4911	HELCO	Middletown	503.1	6,373.7	400.6	80.0	8,418.2
4911	Connecticut Light & Power	Milford	202.7	2,981.1	188.1	37.2	3,946.6
4911	Connecticut Light & Power	Montville	270.1	2,954.2	185.9	36.8	3,905.6
3429	Stanley Works	New Britain	56.5	115.5	10.6	397.2	119.8
5171	Gulf Oil Corp. (2)	New Haven	4.6	46.4	2.8	290.9*	35.0
4911	United Illuminating (2)	New Haven	35.3	5,125.9	322.8	64.2	6,788.2*
8221	Yale University (2)	New Haven	41.2	370.0*	28.8	6.2	281.0*
2652	Simkins Industry	New Haven	29.9	278.8	18.1	3.5	217.2
5171	Atlantic Richfield	New Haven	0	0	0	127.9	0
4911	Connecticut Light & Power	Norwalk	301.5	4,499.9	283.5	56.5	3,404.9
2834	Biersdorf Inc.	Norwalk	0.2	1.9	0.2	252.0	2.8
2295	Pervel Industry Inc. (2)	Moosup	12.5	35.5	2.3	3,514.0	30.7
3261	American Standard	Moosup	11.7	21.8	2.7	858.5	32.8
3321	Plainville Castings	Plainville	36.6	23.5	317.0	0.2	14.1

Table 4: CONNECTICUT INDUSTRIES CLASSIFIED AS MAJOR STATIONARY SOURCES FOR
(con'd) ONE OR MORE POLLUTANT TYPES UNDER THE 1977 CLEAN AIR ACT AMENDMENTS

SIC Code	Name of Firm	Location	Controlled Emissions (tons/year)				
			TSP	SO_2	CO	HC	NO_2
7218	Glove Reconditioners	Fairfield	0.2	1.2	0.1	476.0	1.7
4911	United Illuminating	Bridgeport	671.8	11,111.5	697.0	139.0	14,676.4
3312	Carpenter Technologies	Bridgeport	28.5	4.2	940.9	7.4	72.7
3699	Columbia Magnetics	Danbury	1.7	15.9	1.1	600.1	15.1
3411	National Can Corp.	Danbury	0.1	0	0.2	680.0	9.7
2261	Hull Dye & Pr. (2)	Derby	22.9	225.5	17.4	717.3	213.1
3724	Pratt & Whitney (3)	East Hartford	306.3	880.9*	307.7	194.0	1907.1
4953	East Hartford Public Works	East Hartford	303.2	72.0	1079.0	47.0	79.0
4021	Cos Cob Power Plant	Greenwich	1,102.9	1,862.7	49.0	24.5	367.6
2834	Pfizer Inc. (2)	Groton	119.4	1,646.2	173.7	1,311.8	1,238.2
4953	Naval Submarine	Groton	26.1	259.5	17.2	3.0	195.9
3497	M. Swift & Son	Hartford	0.6	8.7	3.6	510.0	7.2
4952	MDC Hartford	Hartford	149.7	51.3	0.9	49.8	264.0
3229	Glass Containers	Dayville	250.5	305.4	19.0	3.6	230.5
3079	Dow Chemical	Gales Ferry	17.7	108.9	6.9	162.3	85.8
8221	University of Connecticut	Mansfield	29.6	290.4	17.6	3.2	228.0
3069	E. I. Dupont	Fairfield	1.6	17.8	1.0	127.7	14.0

Table 4: CONNECTICUT INDUSTRIES CLASSIFIED AS MAJOR STATIONARY SOURCES FOR
(con'd) ONE OR MORE POLLUTANT TYPES UNDER THE 1977 CLEAN AIR ACT AMENDMENTS

			Controlled Emissions (tons/year)				
SIC Code	Name of Firm	Location	TSP	SO_2	CO	HC	NO_2
2653	Federal Paperboard	Baltic	61.5	611.6	38.4	7.6	461.5
2641	Acme Backing	Stamford	0.6	6.7	0.4	284.0	5.7
3079	U.S. Polymeric	Stamford	0.5	6.8	0.4	565.5	6.5
4953	Stamford Municipal Incinerator	Stamford	99.4	166.0	2,321.0	99.0	199.0
3079	Ross & Roberts	Stamford	1.5	13.9	1.0	313.4	12.6
2861	Connecticut Charcoal	Union	266.0	0	210.0	322.0	0
2261	The Amerbelle Co.	Rockville	15.0	69.8	4.3	341.8	57.2
2821	American Cyanimid (2)	Wallingford	84.5	160.6	17.2	345.2*	144.5
3351	Century Brass	Waterbury	51.4	355.2	46.0	215.4	271.8
2284	Hemingway & Bartlet	Watertown	0	0	0	380.0	0
3011	Armstrong Rubber Co.	West Haven	43.0	101.8	6.4	404.2	77.1
3811	Combustion Engineering	Windsor	51.0	301.3	5.6	0.8	115.4
2649	Dexter Corp.	Windsor Locks	31.6	291.6	18.5	185.1	226.0

Total: 51 Firms

Source: Department of Environmental Protection, December 1980

Table 5: Comparison of Emissions from 100 Ton Point Sources to Emissions from all Point Sources in Connecticut: 1980

Controlled Emissions in Tons per Year

Category	TSP	SO_2	CO	HC	NO_2	Total
1) Emissions from 100 ton sources	4,587.5	42,796.1	11,987.7	16,398.2	49,558.0	125,327.5
2) Number of Firms with 100 tons of emissions or greater of any one pollutant	13	37	18	48	42	91*
3) Emissions from all point sources	10,561.5	56,645.0	14,285.5	22,128.0	62,256.6	165,876.6
4) Percent of Total Point Source emissions from 100 ton sources	43.4%	75.6%	83.9%	74.1%	79.6%	75.6%

* Individual sums for each of the five pollutants adds up to more than 91 due to the fact that many firms have emissions of 100 tons for more than one pollutant category.

Source: CNVRPA Staffwork based on data supplied by the Connecticut Department of Environmental Protection, December 1980

Table 6:

Actual Annual Average Emissions of Total Suspended Particulates by the 30 Largest Industrial Emitters in the United States: 1980

SIC Code	Industry Description	Annual Average emissions of TSP per Firm (tons)	Number of Firms Surveyed
3334	Primary production of Aluminum	1,991.9	48
3312	Blast Furnaces, Steel works & rolling mills	1,991.4	250
3241	Cement, hydraulic	1,380.4	309
2040	Grain Mill products	1,138.3	78
2621	Papermills, except building paper	1,079.7	297
3331	Primary Smelting and refining of copper	889.2	26
3332	Primary Smelting and refining of Zinc	821.1	20
2611	Pulp mills	818.9	68
3275	Gypsum products	573.2	73
2823	Cellulosic Man Made Fibers	568.3	20
2861	Gum and Wood Chemicals	544.7	46
2822	Synthetic Rubber	527.5	47
3251	Brick and Structural Clay Tile	517.9	203
3281	Cut Stone and Stone products	499.5	157
3259	Structural Clay products NEC	484.7	20
2890	Miscellaneous Chemical Products	443.4	8
2631	Paperboard Mills	443.3	98
2645	Die Cut paper and board	439.4	25
2061	Raw cane sugar	412.9	40
3255	Clay refractories	391.9	87
3274	Lime	382.0	167
2812	Alkalies and Chlorine	310.2	45
3339	Primary nonferrous metals NEC	288.1	39
2492	Miscellaneous Wood Products	285.3	37
2874	Phosphate fertilizers	281.0	53
3223	Glass	280.0	95
2031	Preserved fruits and vegetables	277.1	11
2865	Cyclic Crudes & Intermediates	268.6	50
3296	Mineral Wool	258.5	54
2062	Cane sugar refining	250.5	53

Source: National Emissions Data System, NEDS SIC Emissions Report: National Selection Summary and CNVRPA Staffwork, November 1980

Table 7: Total Air Pollution Emissions from All Sources in the Central Naugatuck Valley Region after Controls: 1980 (in tons)

Municipality	TSP	SO_2	CO	HC	NO_2
Beacon Falls	122.0	69.8	3,129.7	392.1	393.9
Bethlehem	15.0	31.1	369.4	90.3	60.2
Cheshire	333.6	287.4	11,672.2	1,373.3	1,107.3
Middlebury	175.4	200.5	4,310.1	764.8	718.2
Naugatuck	219.0	566.3	4,038.4	878.0	875.7
Oxford	36.0	57.7	1,204.4	149.5	140.4
Prospect	113.6	56.7	1,165.5	173.8	138.6
Southbury	221.9	294.7	5,016.4	703.9	938.8
Thomaston	96.4	116.4	2,018.9	508.6	394.0
Waterbury	1,276.7	1,788.9	22,246.9	4,308.5	3,403.3
Watertown	384.8	245.3	5,895.3	1,977.7	631.0
Wolcott	125.8	120.9	3,604.0	475.7	338.1
Woodbury	160.6	100.6	1,591.2	214.0	218.1
Total	3,280.8	3,936.3	66,462.4	12,010.2	9,357.6
Percent of Total Emissions from Registered Sources	9.1%	38.8%	0.5%	10.9%	13.6%

Source: CNVRPA staff work based on data supplied by the Connecticut Department of Environmental Protection, November 1980.

Table 8: Controlled Emissions of Total Suspended Particulates by the 22 Largest TSP Emitters in the Central Naugatuck Valley Region: 1980

	Firm	Municipality	Annual Emissions of Total Suspended Particulates
1.	Century Brass Products	Waterbury	60.3
2.	Oneglia & Gervasini	Woodbury	54.0
3.	Uniroyal Chemical Plant	Naugatuck	30.7
4.	Brownstein Realty	Waterbury	24.6
5.	Leverty & Hurley Co.	Waterbury	13.5
6.	Southbury Training School	Southbury	8.8
7.	Hamden Sand & Gravel	Beacon Falls	8.0
8.	Waterbury Foundry	Waterbury	7.5
9.	Eastern Co., Alloy Foundries Div.	Naugatuck	7.3
10.	Uniroyal Corporation	Middlebury	7.2
11.	Waterbury Sludge Incinerator	Waterbury	6.0
12.	Fleicher Finishing Co.	Waterbury	5.6
13.	Waterbury Hospital	Waterbury	5.6
14.	Consolidated Industries	Cheshire	4.8
15.	Colonial Sand & Gravel	Watertown	4.0
16.	Plume & Atwood Brass Mill	Thomaston	3.5
17.	Kem-Blo Corp.	Naugatuck	3.4
18.	North American Phillips	Cheshire	3.1
19.	Taft School Corp.	Watertown	2.8
20.	Wiltshire Industries	Waterbury	2.0
21.	Chase Brass & Copper	Waterbury	2.0
22.	Timex Corp. & Industry	Middlebury	2.0
	Total Emissions		266.7
	Total TSP Emissions from all registered point sources		300.1
	Percent of all TSP emitted by the 22 firms		88.9%

Source: CNVRPA staff work based on data supplied by the Connecticut Department of Environmental Protection, November 1980.

Table 9: Controlled Emissions of Total Suspended Particulates by the 10 Largest Emitters in the City of Waterbury: 1980

Firm	Annual Emissions of Total Suspended Particulates
Century Brass Products	60.3
Brownstein Realty	24.6
Leverty & Hurley Co.	13.5
Waterbury Foundry	7.5
Waterbury Sludge Incinerator	6.0
Fleisher Finishing	5.6
Waterbury Hospital	5.3
Colonial Sand & Gravel	4.0
Wiltshire Industries	2.0
Chase Brass & Copper	2.0
Total Emissions	130.8
Total Emissions from all registered point sources	142.5
Percent of all TSP emitted by the ten firms	91.8%

Source: CNVRPA staff work based on data supplied by the Connecticut Department of Environmental Protection, November 1980.

Table 10: Summary of Area and Point Sources of Emissions of Total Suspended Particulates in Waterbury and the Central Naugatuck Valley Region: 1980

Source	Waterbury (tons/year)	Percent of Total (%)	Central Naugatuck Valley Region (tons/year)	Percent of Total (%)
Point Sources	142.5	11.2	300.1	9.1
Area Sources	1143.2	88.8	2981.2	90.9
Residential	42.4	3.3	93.9	2.9
Commercial/ Institutional	4.2	0.3	8.6	0.3
Industrial	2.3	0.2	4.9	0.1
Transportation	598.0	46.8	1844.1	56.2
Fugitive Dust	480.0	37.6	919.0	28.0
Miscellaneous- (fires)	7.2	0.6	110.5	3.4
Total	1276.7	100.0	3281.3	100.0

Source: Connecticut Department of Enviromental Protection, Area Source Emission Inventory for Waterbury, November, 1980 and Registered Point Sources for Particulate Emissions, November, 1980.

Table 11: Registered Sources of Air Pollution Emission in the Central Naugatuck Valley Region before Controls: 1980
(in tons)

Municipality	TSP	SO_2	CO	HC	NO_2	Number of Firms
Beacon Falls	10.5	18.1	0.9	-	17.0	7
Bethlehem	-	-	-	-	-	-
Cheshire	30.6	68.1	3.8	6.5	64.7	16
Middlebury	10.4	108.2	8.2	0.8	92.7	4
Naugatuck	1,040.4	311.4	18.7	638.0	239.4	18
Oxford	0.2	2.2	-	-	2.0	2
Prospect	-	1.0	-	-	0.8	1
Southbury	9.6	101.9	6.2	0.8	79.6	6
Thomaston	31.3	33.9	1.8	115.0	30.9	7
Waterbury	6,351.4	803.0	535.5	569.6	682.4	117
Watertown	15.0	56.1	3.2	395.3	46.2	15
Wolcott	0.8	12.2	0.3	-	10.6	6
Woodbury	1,604.8	10.7	0.9	-	10.8	5
Total	9,105.0	1,526.8	579.5	1,726.0	1,277.1	204

Source: CNVRPA staff work based on data supplied by the Connecticut Department of Environmental Protection, November 1980.

Table 12: Registered Sources of Air Pollution Emissions in the Central Naugatuck Valley Region After Controls: 1980
(in tons)

Municipality	TSP	SO_2	CO	HC	NO_2	Number of Firms
Beacon Falls	10.5	18.1	0.9	-	17.0	7
Bethlehem	-	-	-	-	-	-
Cheshire	12.7	68.1	3.8	6.5	64.7	16
Middlebury	10.4	108.2	8.2	0.8	92.7	4
Naugatuck	47.8	311.4	18.7	233.1	239.4	18
Oxford	0.2	2.2	-	-	2.0	2
Prospect	-	1.0	-	-	0.8	1
Southbury	9.6	101.9	6.2	0.8	79.6	6
Thomaston	5.5	33.9	1.8	115.0	30.9	7
Waterbury	142.5	803.0	261.9	559.2	682.4	117
Watertown	5.3	56.1	3.2	395.3	46.2	15
Wolcott	0.8	12.2	0.3	-	10.6	6
Woodbury	54.8	10.7	0.9	-	10.8	5
Total	300.1	1,526.8	305.9	1,310.7	1,277.1	204

Source: CNVRPA staff work based on data supplied by the Connecticut Department of Environmental Protection, November 1980.

Table 13: The Eleven Major Point Sources of Total Suspended Particulates which have Contributed the Most to the Reduction of TSP Emissions in the Central Naugatuck Valley Region: 1980

Firm	Location	Annual Volume of TSP Eliminated through Use of Controls (tons)
New Haven Trap Rock	Waterbury	2,247.8
Oneglia & Gervasini	Waterbury	1,798.2
Oneglia & Gervasini	Woodbury	1,550.0
Leverty & Hurley	Waterbury	1,336.5
Eastern Co.: Alloy Foundry Division	Naugatuck	958.7
Century Brass Products	Waterbury	360.9
Waterbury Sludge Incinerator	Waterbury	294.0
Combustion Equipment Associates	Waterbury	96.1
Uniroyal Chemical	Naugatuck	33.9
Waterbury Rolling Mills	Waterbury	31.4
Plume & Atwood	Thomaston	20.3
Total		8,727.8

Total TSP emissions eliminated by all point sources in the Region 9,105.0

Percent of all TSP eliminated by the eleven major firms 95.9%

Table 14: Comparison of Annual Emissions of TSP and SO_x from Expanding and Declining Firms in the Central Naugatuck Valley Region: 1977-1979

(Based on All Firms with Over 90 Employees in the Region)

Status of Firms over the Period 1977-79	Firms Surveyed	Percent Distribution	TSP Emitted (Tons)	Percent Distribution	SO_x Emitted (Tons)	Percent Distribution	Employment in 1979	Percent Distribution
Declining Employment	26	26.5	54.1	36.4	429.4	40.6	10,339	30.5
Expanding Employment	67	71.2	94.3	63.5	628.2	59.3	23,309	68.8
Steady State Employment	2	2.1	0.0	0.0	0.0	0.0	190	0.5
Total	94	100.0	148.4	100.0	1057.6	100.0	33,838	100.0
Regional Total	700	-	300.1	-	1526.8	-	105,617	-

Source: CNVRPA staff work based on point source data supplied by the Department of Environment Protection and a CNVRPA survey of firms with employment levels greater than 90, November 1980.

Talbe 15: Relationships between Air Pollution Emissions and Number of Employees for 254 Selected Industry Groups in Connecticut: 1980

Size of Firm (Number of Employees)	Emissions (in Tons per Year)				
	TSP	SO_2	NO_2	HC	CO
25 and over	2.25	1.77	7.62	1.23	0.12
26 - 50	3.61	1.84	2.14	6.44	0.30
51 - 100	0.52	3.52	2.99	0.38	0.22
101 - 250	1.89	13.97	11.07	8.61	0.83
251 - 500	4.92	18.35	15.71	23.43	1.22
501 and over	14.02	57.51	47.47	40.11	3.42
Average for All Firms	3.41	13.45	11.90	10.62	0.85

Source: CNVRPA staff work based on a survey of 254 Connecticut Industry Groups conducted during the summer of 1980 and emissions data supplied by the Connecticut Department of Environmental Protection, August 1980.

Table 16: Annual Average Emissions of Total Suspended Particulates per Employee by Major Industry Groups in the Central Naugatuck Valley Region: 1980

	SIC Code	Industrial Description: Level 1	Annual TSP Emissions per Employee (Tons)	Effective Annual TSP Emissions for a Firm with 100 Employees (Tons)
1	329	Miscellaneous Non Metal Mineral Products	.338	33.8
2	301	Tires and Inner Tubes	.084	8.4
3	289	Miscellaneous Chemical Products	.057	5.7
4	248	Millwork Plywood and Structural Members	.056	5.6
5	265	Paperboard Containers and Boxes	.041	4.1
6	331	Blast Furnaces and Basic Steel Products	.035	3.5
7	281	Industrial Inorganic Chemicals	.035	3.5
8	336	Non Ferrous Foundries	.019	1.9
		Industrial Description: Level 2		
9	335	Non Ferrous Rolling and Drawing	.014	1.4
10	381	Engineering and Scientific Instruments	.011	1.1
11	225	Knitting Mills	.011	1.1
12	347	Metal Services NEC	.011	1.1
13	367	Electronic Components and Accessories	.010	1.0
14	228	Yarn and Thread Mill	.010	1.0
15	346	Metal Forgings and Stampings	.008	0.8
16	344	Fabricated Structural Metal Products	.008	0.8
17	342	Cutlery, Handtools and Hardware	.008	0.8

Table 16: Annual Average Emissions of Total Suspended Particulates per Employee
(con'd) by Major Industry Groups in the Central Naugatuck Valley Region: 1980

	SIC Code	Industrial Description: Level 2	Annual TSP Emissions per Employee (Tons)	Effective Annual TSP Emissions for a Firm with 100 Employees (Tons)
18	202	Dairy Products	.007	0.7
19	364	Electric Lighting and Wiring Equipment	.006	0.6
20	306	Fabricated Rubber Products	.005	0.5
21	207	Fats and Oils	.005	0.5
22	307	Miscellaneous Plastic Products	.004	0.4
23	396	Costume Jewelry and Notions	.004	0.4
24	354	Metal Working Equipment	.003	0.3
25	373	Ship and Boat Building and Repairing	.003	0.3
26	345	Screw Machine Products, Bolts	.003	0.3
27	251	Household Furniture	.003	0.3
28	355	Special Industry Machinery	.002	0.2
29	205	Bakery Products	.002	0.2
30	275	Commercial Printing	.002	0.2
31	284	Soaps, Cleaners and Toilet Goods	.002	0.2
32	233	Womens and Misses Outerwear	.002	0.2
33	384	Medical Instruments and Supplies	.001	0.1
34	234	Womens and Childrens Undergarments	.001	0.1

Table 16: Annual Average Emissions of Total Suspended Particulates per Employee
(con'd) by Major Industry Groups in the Central Naugatuck Valley Region: 1980

	SIC Code	Industrial Description: Level 2	Annual TSP Emissions per Employee (Tons)	Effective Annual TSP Emissions for a Firm with 100 Employees (Tons)
35	366	Communication Equipment	.001	0.1
36	387	Watches, Clocks, and Watchcases	.0003	0.03
37	232	Men's and Boy's Furnishings	0.0	0.0

Source: CNVRPA staff work based on a survey of Connecticut Industries concentrated in the Central Naugatuck Valley Region and the data files of the Connecticut Department of Environmental Protection, November 1980.

Table 17: Relationship between Air Pollution Emissions and Square Feet of Floor Area for 254 Selected Industry Groups in Connecticut: 1980

Size of Firm (in Square Feet)	Emissions (in Tons per Year)				
	TSP	SO_2	NO_2	HC	CO
25,000 and under	0.57	1.79	1.48	0.01	0.25
25,000 to 50,000	2.20	2.64	2.59	4.37	0.17
50,001 to 75,000	1.05	3.92	8.52	2.72	0.23
75,001 to 100,000	0.79	6.19	5.31	2.26	0.42
100,001 to 150,000	0.85	6.91	6.27	19.33	0.43
150,001 to 250,000	2.73	9.53	8.18	19.30	0.58
250,001 and over	15.90	66.89	53.70	30.08	4.07
Average for All Firms	3.41	13.45	11.90	10.62	0.85

Source: CNVRPA staff work based on a survey of 254 Connecticut Industry Groups conducted during the summer of 1980 and emissions data supplied by the Connecticut Department of Environmental Protection, August 1980.

Table 18: Comparison of Economic Growth Potential and Total Suspended Particulate Emission Rankings for 21 Industries with Growth Potential in the Waterbury Labor Market Area

Standard Industrial Classification	Industry	Economic Growth Potential Rank	DEP TSP Air Quality Rank	Average Number of Tons of TSP Emissions Per Firm	NEDS TSP Air Quality Rank	Average Number of Tons of TSP Emissions Per Firm
3479	Metal Coating and Allied Services	1	11	1.57	16	5.41
3841	Surgical and Medical Instruments	2	5	0.52	6	1.13
3843	Dental Equipment and Supplies	3	4	0.46	10	2.43
3842	Surgical Applicances and Supplies	4	6	0.60	7	1.32
3549	Metalworking Machinery NEC*	5	NA	-	2	0.17
3832	Optical Instruments and Lenses	6	10	1.35	3	0.33
3579	Office Machines, Typewriters, etc.	7	14	2.69	5	0.75
3678	Electronic Connectors	8	NA	NA	9	2.00
3573	Electronic Computing Equipment	9	NA	NA	18	6.34
3421	Cutlery	10	1	0.40	15	3.45
3674	Semi-Conductors and Related Devices	11	13	2.38	14	3.00
2752	Commercial Printing, Lithographic	12	2	0.42	8	1.68
2339	Women's and Misses' Outerwear NEC*	13	2	0.42	13	3.00
2844	Toilet Preparations	14	9	1.18	17	5.79
2024	Ice Cream and Frozen Deserts	15	8	0.73	12	2.64
2647	Sanitary Paper Products	16	15	6.34	21	45.80
3498	Fabricated Pipe and Fittings	17	NA	NA	4	0.73

Table 18: Comparison of Economic Growth Potential and
(con'd) Total Suspended Particulate Emission Rankings
for 21 Industries with Growth Potential in
the Waterbury Labor Market Area

Standard Industrial Classification	Industry	Economic Growth Potential Rank	DEP TSP Air Quality Rank	Average Number of Tons of TSP Emissions Per Firm	NEDS TSP Air Quality Rank	Average Number of Tons of TSP Emissions Per Firm
3564	Blowers and Fans	18	7	0.70	11	2.48
3079	Miscellaneous Plastic Products	19	12	1.84	19	9.76
3563	Air and Gas Compressors	20	NA	NA	1	0.13
2649	Converted Paper Products	21	16	45.47	20	16.35

NEC = Not elsewhere classified.

NA = Not available

Source: The Locational Advantage of the Waterbury Labor Market Area: 21 Industries with Growth Potential, CNVRPA, 1979, p. 53 and data supplied by the National Emission Data System of the U.S. Environmental Protection Agency, August 1980.

Table 19: Grid Cell 4132: Captain Neville Drive

Development Scenario A (worst case)

Firm	SIC Code	Total Square Feet	Percent of Total	Square Feet per Employee	Total Employees	Tons of TSP per Employee	Total Tons of TSP per Firm	Tons of SO_2 per Employee	Total Tons of SO_2 per Firm
A-3	265	1,115,136	40	1106	1008	.041	41.3	.387	390.1
B-3	367	278,784	10	2640	106	.010	1.1	.009	1.0
C-3	346	557,568	20	592	942	.008	7.5	.026	24.5
D-3	381	278,784	10	249	1120	.011	12.3	.068	76.2
E-3	347	278,784	10	525	531	.011	5.8	.033	17.5
F-3	228	278,784	10	1141	244	.010	2.4	.090	22.0
Total 6	-	2,787,840	100%	-	3851	-	70.4	-	531.2

Development Scenario B (best case)

Firm	SIC Code	Total Square Feet	Percent of Total	Square Feet per Employee	Total Employees	Tons of TSP per Employee	Total Tons of TSP per Firm	Tons of SO_2 per Employee	Total Tons of SO_2 per Firm
A-4	384	1,115,136	40	428	2605	.001	2.6	.013	33.8
B-4	354	278,784	10	626	445	.0035	1.6	.033	14.7
C-4	367	557,568	20	2640	211	.010	2.1	.009	1.9
D-4	347	278,784	10	525	531	.011	5.8	.033	12.5
E-4	202	278,784	10	789	405	.007	2.8	.059	23.8
F-4	342	278,784	10	473	589	.008	4.7	.028	16.5
Total 6	-	2,787,840	100%	-	4786	-	19.6	-	103.2

1. Total vacant acres: 40
2. Maximum ground coverage: 40%
3. Effective ground area available: 16
4. Maximum height of structure: 60 feet (4 stories)
5. Effective number of acres: 64
6. Effective number of square feet available: 2,787,840

Source: CNVRPA staff work based on data supplied by the Waterbury Urban Renewal Agency and the Waterbury Zoning Regulations, January 1981.

Table 20: Grid Cell 4132: Air Quality Impact at Maximum Development for Existing Firms in the Captain Neville Drive Industrial Park

Firm	SIC Code	Additional Square Feet Available for Expansion	Square Feet per Employee	Additional Employment From Expansion	Tons of TSP per Employee	Total Additional Tons of TSP per Firm	Tons of SO_2 per Employee	Total Additional Tons of SO_2 per Firm
Plastiglide #1	346	297,038	1,134	261	.008	2.08	.0265	6.91
Plastiglide #2	346	26,508	1,134	23	.008	0.18	.0265	0.60
Selectrons Limited	347	89,159	894	100	.011	1.1	.0337	3.37
Aljim Foods		85,383	1,778	48	.0003	0.014	.0009	0.04
Waterbury Swiss Automatics	345	109,274	322	339	.003	1.01	.0317	10.74
Industrial Paper & Plastics	307	62,208	1,350	46	.004	0.18	.0453	2.08
Robert Shaw Controls	389	587,209	382	1,537	.0003	0.46	.0009	1.38
Dossert Corp.	364	98,160	467	210	.006	1.26	.0574	12.05
P.R. Mallory	369	143,256	170	843	.0026	2.19	.0281	23.68
Total	-	1,498,195	-	3,407	-	8.47	-	60.85

Source: CNVRPA staff work based on data supplied by the Waterbury City Plan Commission and the Waterbury Zoning Regulations, January 1981.

Table 21: Grid Cell 4528: Waterbury Industrial Commons

Development Scenario A (worst case for SO_2)

Firm	SIC Code	Total Square Feet	Percent of Total	Square Feet per Employee	Total Employees	Tons of TSP per Employee	Total Tons of TSP per Firm	Tons of SO_2 per Employee	Total Tons of SO_2 per Firm
A-1	265	390,298	20	1106	353	.041	14.5	.387	136.6
B-1	367	195,148	10	2640	74	.010	0.7	.009	0.6
C-1	346	390,298	20	592	659	.008	5.3	.026	17.1
D-1	381	390,298	20	249	1567	.011	17.2	.068	106.5
E-1	347	292,723	15	525	558	.011	6.1	.033	18.4
F-1	228	292,723	15	1141	257	.010	2.6	.090	23.1
Total 6	-	1,951,488	100%	-	3468	-	46.4	-	302.3

Development Scenario (best case)

Firm	SIC Code	Total Square Feet	Percent of Total	Square Feet per Employee	Total Employees	Tons of TSP per Employee	Total Tons of TSP per Firm	Tons of SO_2 per Employee	Total Tons of SO_2 per Firm
A-2	384	390,298	20	428	912	.001	0.9	.013	11.8
B-2	354	195,148	10	626	312	.0035	1.1	.033	10.3
C-2	367	390,298	20	2640	148	.010	1.5	.009	1.3
D-2	347	398,298	20	525	743	.011	8.2	.033	24.5
E-2	202	292,723	15	689	425	.007	3.0	.059	25.0
F-2	342	292,723	15	473	619	.008	5.0	.028	17.3
Total 6	-	1,951,488	100%	-	3159	-	19.7	-	90.2

1. Total vacant acres: 28
2. Maximum ground coverage: 40%
3. Effective land area available: 11.2
4. Maximum number of stories: 60 feet (4 stories)
5. Effective number of acres available: 44.8
6. Effective number of square feet available: 1,951,488

Source: CNVRPA staff work based on data supplied by the Waterbury Urban Renewal Agency and the Waterbury Zoning Regulations, January 1981.

Table 22: Grid Cell 4528: Waterbury Industrial Commons

Development Scenario A (worst case for TSP)

Firm	SIC Code	Total Square Feet	Percent of Total	Square Feet per Employee	Total Employees	Tons of TSP per Employee	Total Tons of TSP per Firm	Tons of SO_2 per Employee	Total Tons of SO_2 per Firm
A-1	265	390,298	20	1106	353	.041	14.5	.387	136.6
B-1	331	195,148	10	1527	128	.035	4.4	.064	8.2
C-1	301	390,298	20	1423	274	.084	23.0	.208	57.0
D-1	281	390,298	20	452	863	.035	30.2	.014	12.1
E-1	336	292,723	15	683	429	.019	8.1	.029	12.4
F-1	289	292,723	15	890	329	.056	18.4	.143	47.0
Total 6	-	1,951,488	100%	-	2376	-	98.6	-	273.3

Development Scenario (best case)

Firm	SIC Code	Total Square Feet	Percent of Total	Square Feet per Employee	Total Employees	Tons of TSP per Employee	Total Tons of TSP per Firm	Tons of SO_2 per Employee	Total Tons of SO_2 per Firm
A-2	384	390,298	20	428	912	.001	0.9	.013	11.8
B-2	354	195,148	10	626	312	.0035	1.1	.033	10.3
C-2	367	390,298	20	2640	148	.010	1.5	.009	1.3
D-2	347	398,298	20	525	743	.011	8.2	.033	24.5
E-2	202	292,723	15	689	425	.007	3.0	.059	25.0
F-2	342	292,723	15	473	619	.008	5.0	.028	17.3
Total 6	-	1,951,488	100%	-	3159	-	19.7	-	90.2

1. Total vacant acres: 28
2. Maximum ground coverage: 40%
3. Effective land area available: 11.2
4. Maximum number of stories: 60 feet (4 stories)
5. Effective number of acres available: 44.8
6. Effective number of square feet available: 1,951,488

Source: CNVRPA staff work based on data supplied by the Waterbury Urban Renewal Agency and the Waterbury Zoning Regulations, January 1981.